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(54) "Castor"

(57) A castor for a trolley comprises a spindle 14 connected to a swivelling fork 12 supporting a castor wheel 8. The spindle 14 is slidable and rotatable in a sleeve 15 connected to a trolley carrier. When the carrier is loaded the sleeve 15 moves against the action of spring 19, and a protuberance 26 on the sleeve engages a depression 23 in a cam surface 22 on the fork 12 to limit the rotation, i.e. the swivelling of the castor wheel.

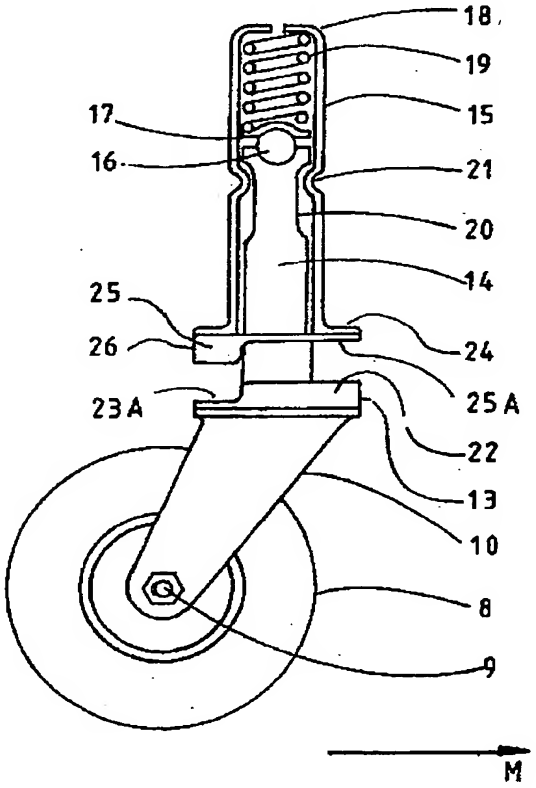

FIG. 3

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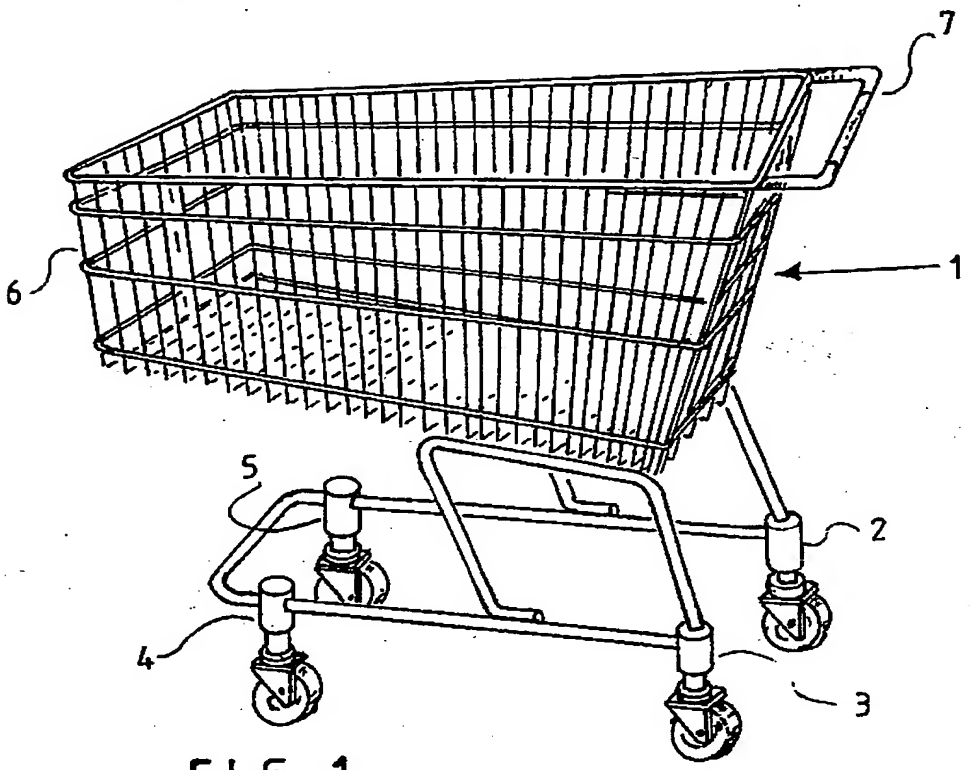


FIG. 1

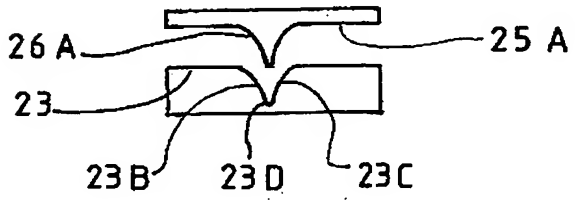
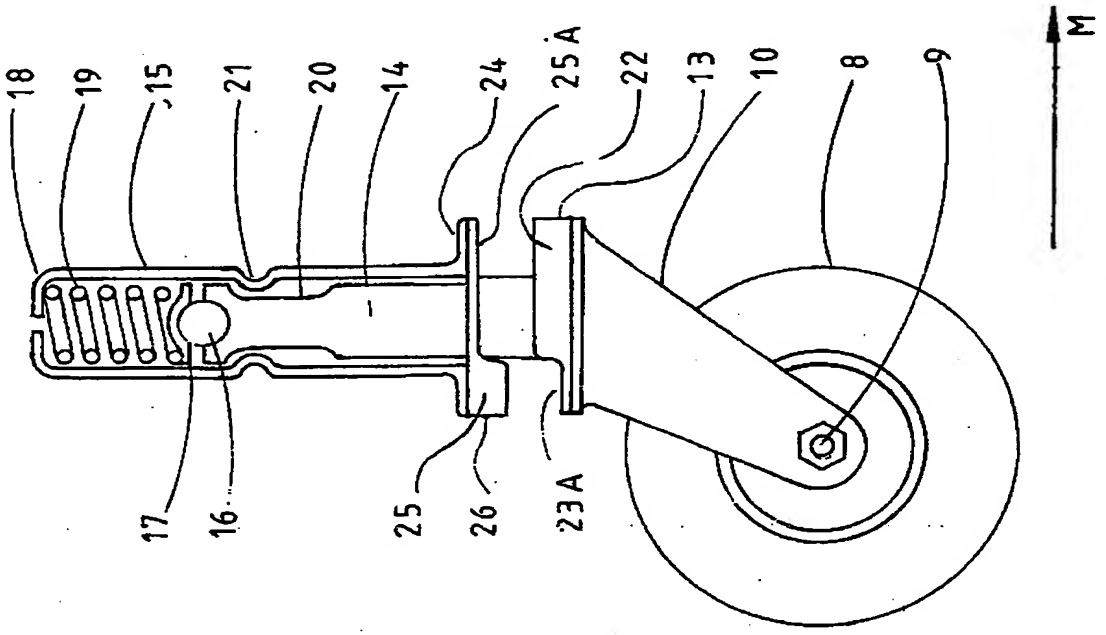


FIG. 7


18
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14
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25A
22
13
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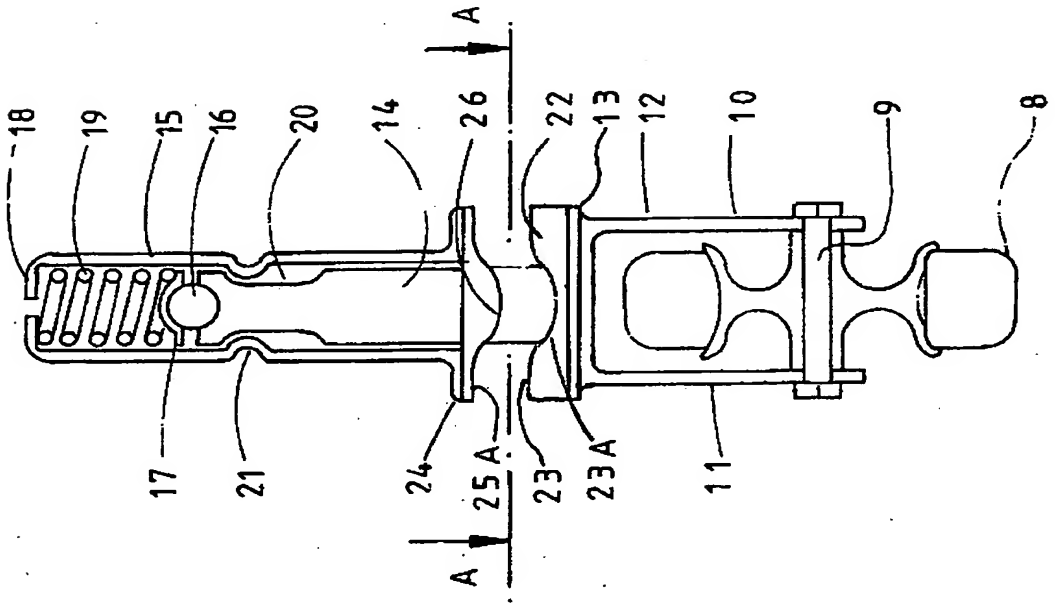
M
17
16
25
26
23A

FIG. 3


A
18
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23A
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A

FIG. 2

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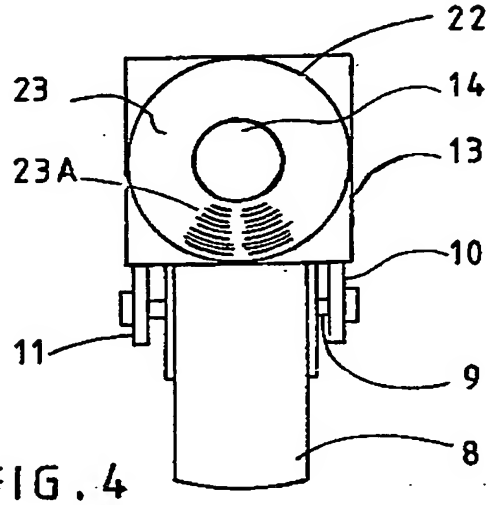

FIG. 4

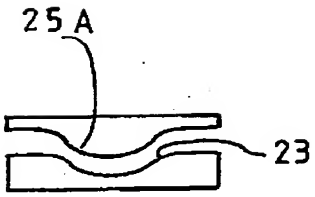

FIG. 5A

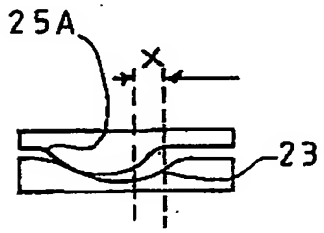

FIG. 5B

FIG. 5C

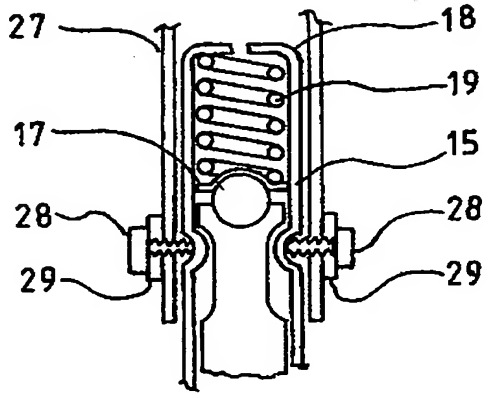

FIG. 6

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SPECIFICATION

CASTORS

Description

Technical Field

The invention relates to castors for trolleys.

It is common practice for trolleys, for example shopping trolleys, to be provided with four swivellable castors which swivel through 360 degrees. These enable the trolley to be moved around in supermarkets, airports and the like.

However, it has been found that whilst such castors may be satisfactory on planar horizontal floor surfaces, they cause the trolley to become difficult to manage when heavily laden and when ramps and other inclines have to be negotiated.

The present invention has for its object the obviation of these difficulties by the provision of a castor whose swivelling is dependent upon the load applied to it.

Disclosure of the Invention

According to the invention a castor for a trolley comprises a first part for connection to a load-carrying member and a second part connected to a castor wheel, said second part being slidable within the first part, and rotatable therein to provide for swivelling of the castor wheel, one of the first and second parts having a surface which at least in part provides a smoothly-varying cam surface presenting a depression therein, and the other of the first and second parts being provided with a protuberance capable of following the cam surface, and a spring urging the first and second parts apart, the arrangement being such that with increasing load on the castor the first and second parts undergo relative sliding movement against the action of the spring, whereupon under a first predetermined load the second part is freely rotatable relative to the first part, under increased loading the protuberance engages the cam surface to cause automatic relative rotation such that the protuberance enters into the depression whereby limited swivelling dependent on the applied loading is available, and under a second predetermined load the protuberance is fully engaged in the depression, whereby the second part is stabilised in a single angular position relative to the first part.

For a four-wheeled supermarket trolley or luggage trolley it is advantageous that a pair of castors according to the invention are utilised as either the front or the rear castors, so that when the trolley is fully laden these castor wheels are stabilised in the longitudinal direction of the trolley. The laden trolley with only one pair of wheels fully swivellable is then more readily manoeuvrable in narrow or uneven areas.

It will be appreciated that when laden the castors according to the invention are not locked into the longitudinal direction of the trolley, since a sideways action at the appropriate end, e.g. at the handle if the castors are at the rear, will cause the protuberance to ride up the cam surface out of the depression and thereby permit some relative

rotation, i.e. swivelling, between the castor wheel and the trolley carrier.

The above and other aspects, features and advantages of the invention will become apparent from the following description of an embodiment of the invention and modifications thereof.

Brief Description of the Drawings

Figure 1 is a perspective view of a castor in accordance with the invention when attached to a shopping trolley.
Figure 2 is rear view, partly in cross-section, of a castor of the present invention.
Figure 3 is side view partly in cross-section of the castor of Figure 2.
Figure 4 is a plan view taken on the line A-A' of Figure 2.
Figures 5A, 5B and 5C are diagrams illustrating the relative dispositions of parts of the castor under different loadings.
Figure 6 is a fragmentary diagram illustrating an arrangement for mounting the castor on a trolley carrier.
Figure 7 is a diagram similar to Figure 5A showing a modification of the invention.

Modes for carrying out the invention

An embodiment will now be described, by way of example, with reference to the Figures of the drawings.

Figure 1 shows a shopping trolley 1 similar to those frequently used in supermarkets. The trolley comprises a wire carrier 6 having a rear pushing handle 7. The carrier is supported by four swivel castors 2, 3, 4 and 5 of which the rear two castors 2 and 3 are in accordance with the invention as hereinafter described.

The two rear swivel castors 2 and 3 are identical and will now be described with reference to Figures 2 to 5. A castor wheel 8 is mounted for rotation on an axle 9 mounted between legs 10, 11 of a metal swivelling fork 12. The swivelling fork 12 includes a bridge 13

connecting the legs 10,11, at their upper ends. The legs 10,11 are obliquely directed to the vertical as best seen in Figure 3. The bridge 13 has a generally square outline when viewed from above as best seen in Figure 4.

Upstanding centrally from the bridge 13 is a cylindrical spindle 14. The spindle 14 is disposed within a cylindrical metal sleeve 15 so as to be capable of both longitudinal sliding movement and also rotational movement, i.e. swivelling, therein.

The upper end of the spindle 14 is shaped to receive a metal ball 16 which in turn supports a spring seating disc 17. The upper end of the sleeve 15 is turned in to form an end stop portion 18, and a helical compression spring 19 is disposed between the end stop portion 18 and the spring seating disc 17. The spring 19, therefore, acts through the ball 17 to urge spindle 14 and the sleeve 15 away from one another.

The spindle 14 has a portion 20 of reduced diameter and the sleeve 15 has a circular indentation 21 which projects into the space where the diameter of the spindle is reduced. Accordingly, the indentation 21 and the portion of reduced diameter 20 act to limit the distance that the spindle 14 can slide longitudinally within the sleeve 15.

As best seen in Figure 3 the legs 10 and 11 are oblique to the common axis of the spindle 14 and sleeve 15, and the axle 9 is consequently off-set from this axis. With this arrangement when horizontal movement arises the wheel 8 tends to swivel about the said common axis so that the wheel trails the sleeve, that is, the axle 9 is behind the common axis. Thus the arrangement of Figure 3 is appropriate to motion from left to right in the Figure as shown by the arrow M.

Secured on the bridge 13 and surrounding the spindle 14 is a ring 22 which may preferably be of hard plastics material. The upper surface 23 of the ring 22 exterior to the spindle 14 is not planar, but varies gradually and smoothly, at least over a portion of its circumference, to provide a cam surface with a depression 23A which is symmetrical about its deepest point. The sleeve 15, which receives the spindle 14, is

provided at its lower end with an annular flange 24. Secured to the flange 24 is a further ring 25, also preferably of hard plastics material. The lower surface 25A of the the ring 25 is also not planar, but varies gradually and smoothly to provide a protuberance 26 which is symmetrical about its deepest point.

It will be seen that the surface 23 and protuberance 26 together form a cam and cam follower arrangement, and, as shown in Figures 2 and 3, the surfaces match each other. If, therfore, the depression 23A and protuberance 26 are angularly aligned as shown in Figures 2 and 3 and a downwardly acting load of sufficient value is applied to the sleeve 15 this will move against the action of the the spring 19 to cause the protuberance 26 to engage the depression 23 and stabilise the spindle 14 and hence the castor wheel against swivelling.

If the sleeve is attached to a trolley, for example a shopping trolley, with the direction M aligned with the fore-and-aft,i.e. longitudinal, direction of the trolley carrier, stabilising the castor as described above will limit the castor wheel to forward or backward movements of the trolley only.

The position depicted in Figures 2 and 3 shows the protuberance 26 in angular alignment with the depression 23A. If, however, the trolley wheel is displaced so that these are offset from angular alignment, the camming action of the protuberance in engagement with the smoothly-varying cam surface 23 will automatically and readily act to bring the trolley wheel back towards the aligned orientation with the trolley carrier.

The position shown in Figures 2 and 3 represents an unladen trolley where the castor wheel is able to swivel freely. If loading of the trolley takes place the gap between the surfaces 23 and 25A will decrease until under a first predetermined load on the castor the protuberance 26 will only just clear the surface 23 to allow 360 degree swivelling. This position is shown in Figure 5A. In normal usage it is possible, as stated above, that when this stage is reached the protuberance 26 and depression 23A are not in angular alignment as shown

in Figures 2 and 3 , but that the trolley wheel is somewhat offset from longitudinal alignment. Further loading will cause the the protuberance 26 to engage the smoothly varying cam surface 23 so as automatically by the camming action to bring the trolley wheel towards alignment. Figure 5B shows an intermediate position where a limited swivelling rotation as represented by the distances X is available. Continued loading will cause the gap between the surfaces 22 and 25A to decrease and hence cause further camming alignment and further decrease in the available swivelling rotation, until at a second predetermined load on the castor the castor wheel is stabilised in a single direction relative to the sleeve, namely, to the longitudinal direction of the trolley. This position is shown in Figure 5C.

A number of modifications of the above arrangement are possible.

As shown in Figures 2 and 3 the protuberance 26 is at the rear side of the sleeve 15 and the depression is at the rear of the bridge 13. It is quite clear that these could both be at the front. Indeed they can be at any position around the circumference of the flange 24 provided that the angular position for both of them, relative to the forward direction, is the same.

As shown the surfaces 23 and 25A exactly match. However, the protuberance 26 may have a shape different from that of the depression 23, provided it has a surface which can readily engage with the cam surface 22 and sit within the depression 23A

As shown in Figures 2 and 3 the cam surface 23 is supported by the bridge 13 of the swivelling fork 12 and the protuberance is supported by the flange 24 of the sleeve 15. However, it is clear that this arrangement can be reversed, with the cam surface supported on the flange 24 and the protuberance on the bridge 13.

The surfaces 23 and 25A may take various forms. In an alternative arrangement shown in Figure 7 the smoothly-varying cam surfaces 23 has two sides 23B, 23C, which are steeper than in the previous example before they turn to meet at the lowest point 23D of the depression. The

surface 25A provides a protuberance 26A to engage in the depression. The two surfaces 23 and 25A may match each other or may differ. This arrangement provides a more positive engagement of the castor wheel in the fully loaded position. It will be apparent that the two sides 23B, 23C may each include a planar portion.

The castor of the invention may be connected to a trolley carrier in any convenient fashion; for example,the flange 24 may be extended laterally and bolted to an appropriately positioned horizontal plate on the carrier.

However, the cylindrical shape of the sleeve 15 provides for particularly simple connection to a carrier provided with downwardly-directed tubular members. Figure 6 shows an arrangement whereby the sleeve 15 of a castor is inserted into a downwardly-directed vertical tubular metal member 27 connected to a trolley carrier (not shown). Tapped holes in the tubular member 27 receive grub screws 28 which engage in the cylindrical depression in the sleeve 15 and are tightened to effect securement. Washers 29 of suitable shape to conform with the tubular member 27 are disposed between the member 27 and the screw heads.

The above arrangement offers the advantages (a) that the sleeve 15 can be readily rotated relative to the tubular member 27 before securement to ensure that the fore-and-aft direction of the castor aligns with the the fore-and-aft direction of the the carrier, and (b) that the castor can be readily removed and replaced should the need arise.

In a further modification the circular indentation 21 in the sleeve 15 is dispensed with and suitably tapped holes provided instead. In this arrangement the screws 28 secure the tubular member 27 to the sleeve 15 through the holes, and the ends of the screws act as the end-stop for movement of the spindle 14.

It is desirable for a shopping trolley with two front and two rear castors that only one pair of castors, say the rear castors, should be castors in accordance with the invention; the other pair, the front

castors, should remain swivellable under all loads. Such a swivellable castor can readily be provided by modifying the arrangement descibed above so that the surfaces 23 and 25A are planar and horizontal, and, if necessary, increasing the strength of the spring 19, Such a castor can fit into tubular members, similar to the members 27, fitted at the front of the trolley. It will also be apparent that with such a trolley castors in accordance with the invention at the rear could be interchanged with freely swivellable castors at the front if this arrangement was required.

It will be clear that the invention allows the castor wheel to be readily disengaged from the stabilised position when fully loaded by a sideways movement which causes the protuberance 26 or 26A to ride up the cam surface and thereby permit some relative rotation, i.e. swivelling, between the castor wheel and the trolley carrier.

Numerous modifications and variations will be apparent to one skilled in the art without departing from the scope of the invention.

CLAIMS

1. A castor for a trolley comprising a first part for connection to a load-carrying member and a second part connected to a castor wheel, said second part being slidable within the first part, and rotatable therein to provide for swivelling of the castor wheel, one of the first and second parts having a surface which at least in part provides a smoothly-varying cam surface presenting a depression therein, and the other of the first and second parts being provided with a protuberance capable of following the cam surface, and a spring urging the first and second parts apart, the arrangement being such that with increasing load on the castor the first and second parts undergo relative sliding movement against the action of the spring, whereupon under a first predetermined load the second part is freely rotatable relative to the first part, under increased loading the protuberance engages the cam surface to cause automatic relative rotation such that the protuberance enters into the depression whereby limited swivelling dependent on the applied loading is available, and under a second predetermined load the protuberance is fully engaged in the depression whereby the second part is stabilised in a single angular position relative to the first part.

2. A castor as claimed in Claim 1 wherein the first part comprises a cylindrical sleeve provided at its lower end with a flange and the second part comprises a spindle connected to the the bridge of a two-legged swivelling fork between the legs of which a castor wheel is supported, the spindle being slidable and rotatable within the sleeve.

3. A castor as claimed in Claim 2 wherein the flange supports a member provided on its lower surface with a downwardly-directed protuberance and the bridge supports a member provided on its upper annular surface with a smoothly-varying cam surface presenting a depression.

4. A castor as claimed in Claim 2 wherein the flange supports a member provided on its lower surface with a smoothly-varying cam surface

presenting a depression, and the bridge supports a member provided on its upper annular surface with an upwardly-directed protuberance.

5. A castor as claimed in any of Claims 2, 3 or 4 wherein an end stop is provided at the upper end of the cylindrical sleeve and a compression spring is disposed between the end stop and the spindle.

6. A castor as claimed in Claim 5 wherein the spring acts through the intermediary of a spring seat and a metal ball, the upper end of the spindle being shaped to provide a part-spherical bearing surface for the ball to permit rotational movement of the spindle.

7. A castor as claimed in any of Claims 2 to 6 wherein the spindle has a portion of reduced diameter and the sleeve has a circular inwardly-directed indentation which together act to limit the relative sliding movement of the spindle and sleeve.

8. A trolley comprising a carrier supported by four castors of which two are castors according to any preceding claim.

9. A trolley according to Claim 8 wherein the said two castors are received in and detachably secured to two downwardly-directed vertical tubular members fixed to the carrier.

10 A castor substantially as described herein with reference to the accompanying drawings.

11 A trolley substantially as described herein with reference to the accompanying drawings.

—11—

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

GB 9312211.7

Relevant Technical fields

(i) UK Cl (Edition L) A4L (LDF)

(ii) Int Cl (Edition 5) B60B 33/02

Search Examiner

M J PENNELL

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

27 AUGUST 1993

Documents considered relevant following a search in respect of claims 1-11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE FOUND	

Category	Identity of document and relevant passages — 12 —	Relevant to claim(s)

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